

The Functional Outcome Assessment of Arthroscopic Anterior Cruciate Ligament Reconstruction using Quadrupled Hamstring Graft Fixed with Bio-absorbable Versus Titanium Interference Screw

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Abstract

Aim: The comparative analysis of the functional outcome of arthroscopic anterior cruciate ligament reconstruction using quadrupled hamstring graft fixed with bio-absorbable interference screw against titanium interference screw. **Methods:** The Present comparative study of 100 patients treated with arthroscopic anterior cruciate ligament reconstruction with quadrupled hamstring graft with endobutton as the femoral fixation device and titanium interference screw (no=50) and bio-absorbable interference screw (no=50) as tibial fixation device respectively. Patients with closed growth plate, Primary ACL surgery, no evidence of multiple ligament injury, No previous knee surgeries and No ligamentous injury to contralateral knee were included in this study. **Results:** Our study is to evaluate the functional outcome of arthroscopic single bundle ACL reconstruction with quadrupled Hamstring graft with transtibial and transportal techniques using endobutton as femoral fixation device and titanium interference screw in 50 patients and bio absorbable interference screw in 50 patients as tibial fixation device. In our study fall and road traffic accidents predominated as the cause of injury accounting for 36% and 46% respectively. Sports injuries accounted for only 18% in contrary to all international studies. In our study 28% of patients had meniscal injury at presentation and medial meniscus injury predominated lateral meniscus injury like other studies. None of our patients had significant chondral damage at diagnostic arthroscopy. In our study we used transtibial or transportal single bundle reconstruction with quadrupled hamstring graft placing the femoral tunnel between 10 30 and 11'o clock position in the right knee and between 1'o clock and 1 30 position in the left knee. Our study shows that there is no significant difference in the outcomes associated with the use of titanium and bio absorbable interference screws used for anterior cruciate ligament reconstruction. **Conclusion:** Our study shows that there is no difference in functional outcome whether bio absorbable or titanium interference screw was used.

Keywords: absorbable, titanium screw

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Introduction

The knee joint is one of the body's most complicated joint.[1] There is an increase in the occurrence of knee ligament injuries due to the ever-increasing road traffic accidents and increased involvement in sports activities.[2] Knee joint has proximal femur bone distally tibia and fibula bone with ligaments and capsules, meniscus, and bursa. Important ligaments are Anterior cruciate ligament (ACL), Posterior cruciate Ligament (PCL), Medial collateral Ligament (MCL), Lateral collateral Ligament (LCL).[3] The ACL together with other ligaments, capsule is the primary knee stabilizer and prevents anterior translation, and limits valgus and rotational stress to some extent.[4,5,6] The signs of knee instability, discomfort, and a decrease in joint function arise when an ACL injury occurs.[7,8] Even though patients with less expected knee score can be treated with conservative treatment with intensive physiotherapy, bracing and lifestyle modification can be tried in symptomatic young active individuals, ACL reconstruction is necessary.[9] Also ACL injuries are mostly associated with injury of meniscus which can be addressed, else person can develop early onset of osteoarthritis of knee .[10]

Material and methods

This comparative study was carried out in the Department of Orthopaedics, Patna Medical College and Hospital, Patna, Bihar, India from July 2017 to June 2018, after taking the approval of the protocol review committee and institutional ethics committee. 100 patients treated with arthroscopic anterior cruciate ligament

reconstruction with quadrupled hamstring graft with endobutton as the femoral fixation device and titanium interference screw (no=50) and bio absorbable interference screw (no=50) as tibial fixation device respectively.

Inclusion Criteria

- Patients with closed growth plate
- Primary ACL surgery
- No evidence of multiple ligament injury
- No previous knee surgeries
- No ligamentous injury to contralateral knee

Exclusion Criteria

- Additional ligamentous laxity in affected knee
- Previous ACL surgery of either knee
- Chronic muscle disorders
- Any co-existing local conditions in the form of
 - Active articular infection
 - Inflammatory joint disease
- Metabolic bone disease
- Neoplastic disease

Evaluation

All the patients are subjected for post-operative antero posterior and lateral radiographs to determine the tunnel placement and position of endobutton in femur and interference screw in the tibia. Patients are followed at 4 weeks, 8 weeks, 3months, 6 months and once in 6 months thereafter.

All patients are evaluated with Lysholm & Gill Quist scoring.

Knee Scoring Scale of Lysholm & Gill Quist	
Limp	
None	05
Slight /periodic or both	03
Constant or severe or both	00
Support	
None	05
Cane or crutch	02
Weight bearing impossible	00
Locking	
No locking or catching sensations	15
Catching, but no locking sensations	10
Locking – occasionally	06
Locking – Frequently	02
Locked on examination	00
Instability / Giving Way	
Never	25
Rarely during athletic activity or any other heavy exertion	20
Frequently during athletics or any other heavy exertion	15
Rarely in daily activities	10
Frequently in daily activities	05
At every step	00
Pain	
None	25
Inconstant or slight during heavy exertion	20
Marked during heavy exertion	15
Slight during a walk >2 km	10
Marked during a walk <2 km	05
Constant	00
Swelling	
None	10
Mild on exertion	06
Marked on exertion	02
Constant	00
Stair Climbing	
No problems	10
Slightly impaired	06
One step at a time	02
Impossible	00
Squatting	
No problems	05
Slightly impaired	04
Knee flexion possible only up to 90 degrees	02
Impossible	00

Statistical Analysis

Data reported as mean and significant difference between the two groups was studied using Yate's corrected Chi-Square test.

Observation and Results

100 Cases of arthroscopy assisted Anterior cruciate ligament reconstruction with quadrupled hamstring tendon graft using endobutton as the femoral fixation device

and titanium interference screw (no=50) and bio absorbable interference screw (no=50) as tibial fixation device respectively was followed for 6 months to 1 years. The mean follow up was 11.5 months.

Age Distribution

Minimum age was 20 years and maximum age was 53 with a mean age of 30.5 (Table 1)

Table 1: Age distribution

Age	Patients	Percentage
Below 20	6	6
20-25	25	25
25-30	23	23
30-35	18	18
35-40	11	11
40-45	12	12
45-50	3	3
50-55	2	2
Total	100	100

Sex Distribution

In this study, 75 patients were males, and 25 patients were females (table 2)

Table 2: Sex distribution

Sex	Patients	Percentage
Male	75	75
Female	25	25
Total	100	100

Side Involved

In this study, 65 patients had injury in the right knee and 35 patients had injury in the left knee (Table 3)

Table 3: Side involved

Side involved	Patients	Percentage
Right	65	65
Left	35	35
Total	100	100

Table 4: Mode of Injury

Mode of injury	Patients	Percentage
SPORTS	18	18
FALL	36	36
RTA	46	46
TOTAL	100	100

Table 5: Duration of Injury

Duration after injury	Patients	Percentage
<6 WEEKS	22	22
6-3 MONTHS	18	18
3-6 MONTHS	24	24
6-12 MONTHS	24	24
>12 MONTHS	12	12
TOTAL	100	100

Table 6: Associated Injury

Associated injury	Patients	Percentage
Medial meniscus tear	21	21
Lateral meniscus tear	5	5
Both	2	2
Nil	72	72
Total	100	100

Greater number of our patients was seen in the younger age group of 20-35 years. Male reponderance was noticed in our study. Right side was involved more commonly than left side. Road traffic accident was the most common cause accounting for ACL injury. Medial meniscus injury was involved more than the lateral meniscus. Most of the patients returned to their pre-functional level at 4 months.

Scoring Analysis

100 patients of arthroscopic acl reconstruction with quadrupled hamstring graft was followed for a minimum period of 6 months and maximum period of 1 years. All patients are evaluated with Lysholm and Gillquist scoring at the end of 6 months. The maximum score achieved was 100 and minimum score was 58. The scores were graded as

Outcome	Points
Good	84-100
Fair	65-84
Poor	<65

3 patients in titanium interference group and 2 patients in bio absorbable interference screw group lost to followup.

Outcome	Titanium screw (N=50)	Percentage	Bio-abs screw (N=50)	Percentage
Good	43	86	43	86
Fair	4	8	5	10
Poor	3	6	2	4

Discussion

Our study is to evaluate the functional outcome of arthroscopic single bundle ACL reconstruction with quadrupled Hamstring graft with transtibial and transportal techniques using endobutton as femoral

fixation device and titanium interference screw in 50 patients and bio absorbable interference screw in 50 patients as tibial fixation device.

In our study fall and road traffic accidents predominated as the cause of injury

accounting for 36% and 46% respectively. Sports injuries accounted for only 18% in contrary to all international studies. DW Lewis reported 58% meniscal injury associated ACL tear at presentation. Medial meniscus was involved more than the lateral meniscus in his study and he also proposed meniscal repair or resection did not alter the outcome and chondral lesions are a better predictor of functional outcome. Stephen Lyman reported more than 50 % meniscal procedures with ACL reconstructions in 2009. In our study 28% of patients had meniscal injury at presentation and medial meniscus injury predominated lateral meniscus injury like other studies. None of our patients had significant chondral damage at diagnostic arthroscopy.

The fixation of the graft has been proved to be the site of failure rather than the graft itself irrespective of the type of graft especially in the early rehabilitation phase when the graft integration has not taken place and the fixation is of little significance after 8 to 12 weeks when graft has integrated with the bone as proposed by Dawn T Gulick.[11]

In our study we used transtibial or transportal single bundle reconstruction with quadrupled hamstring graft placing the femoral tunnel between 10 30 and 11'o clock position in the right knee and between 1'o clock and 1 30 position in the left knee. John Paul[12] proposed that placing graft at 10 30 position and 1 30 position in single bundle reconstruction reconstructs portions of anteromedial and posterolateral bundles. Masayoshi Yagi[13] showed that anatomic reconstruction allowed better rotatory stability than non anatomic placements of graft. Asheesh Bedi[14] showed that trans portal placement of tunnel achieved more lateral placement than the trans tibial drilling and trans tibial approach to achieve lateral tunnel placements resulted in over reaming of tibia. Though double bundle reconstructions have gained attraction and studies have shown double bundle reconstruction to be superior in providing

stability in high demand patients. Adachi, Ochi and Uchio[15] showed no significant advantage of double bundle reconstruction than anatomic single bundle reconstruction in factors of stability and proprioception in general population.

The metallic screws distort the knee MRI wherein bio absorbable screw avoids impairment of imaging. Apart from this metallic screws have to be removed during surgical revision wherein bio absorbable screws would have been degraded. The major disadvantages are screw breakage at the time of insertion and postoperative inflammatory reaction causing synovitis. We did not come across such problems in our study.

In our study, functional outcome evaluated by Lysholm and Gillquist scoring was nearly equal in both titanium interference screw study group and bio absorbable interference screw study group and it is statistically in significant with P value of 0.88. Our study shows that there is no significant difference in the outcomes associated with the use of titanium and bio absorbable interference screws used for anterior cruciate ligament reconstruction.

Since our study was a short term follow up we could not comment about the arthritic changes post operatively. Fox *et al*[16] reported 3 to 17% incidence of anterior knee pain, compared to 15% in our study, Apostolopoulos[17] reported 10% of anterior knee pain. Kurt Spindler[18] stated regular exercise can lead to increased outcomes in 2005. Our patients are put on home based physiotherapy programe insisting on knee flexion and quadriceps strengthening and mean flexion achieved was 135 degree. JA Grant[19] concluded that home based physiotherapy is cost effective and not significantly inferior to supervised programmes. As overall conclusion several factors influence the functional outcome in arthroscopic ACL reconstruction. Factors like graft choice, graft fixation, tunnel placement and graft

tensioning play a vital role in altering the final outcomes.

Conclusion

The results of our study were comparable with already published reports of comparative study done using bio absorbable versus metal interference screws. Our study shows that there is no difference in functional outcome whether bio absorbable or titanium interference screw was used. The success of ACL reconstruction depend on the correct technique used for the surgery, precise placement of graft and rehabilitation methods than on type of graft fixation device used, neither titanium nor bio absorbable screws. The blunt metal or titanium screw has been the de facto standard in graft fixation. Since the alternate bio absorbable screw overcomes some of the potential drawbacks, it should become the de facto standard in the future.

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